COVID-19 Wastewater Monitoring in Michigan
Sentinel Wastewater Epidemiology Evaluation Project (SWEEP)

How do we interpret this data?

To view Michigan's COVID-19 SWEEP wastewater data, visit the State of Michigan SWEEP Sentinel Wastewater Dashboard. Data is presented in three different tabs on the dashboard (SWEEP Data, Virus Detection, and About) and will be described in detail in this document.

In this document, viewers will learn how to interpret this data and better understand COVID-19 wastewater monitoring and how it can be used.

Purpose
The purpose of SWEEP, and of all COVID-19 wastewater surveillance, is to identify and monitor SARS-CoV-2 in our communities. Monitoring wastewater is advantageous because it can provide an early detection of the virus in a community before individuals may develop symptoms or seek testing. The data from SWEEP will provide a comprehensive, weekly analysis and interpretation of wastewater data from a subset of Michigan's wastewater monitoring sites across the various MERC regions.

Detection of SARS-CoV-2
This project tests wastewater samples for the **N1 and N2 genes** that are present in the SARS-CoV-2 virus. These genes are unique to the SARS-CoV-2 virus, so detection of either gene means the virus is present in the sample. In SWEEP, the samples represent a 24-hour period of wastewater flow to each treatment plant (except for the GLWA metro Detroit samples, which represent the moment in time each sample is taken).

In addition to determining if SARS-CoV-2 is present in a wastewater sample, the testing methods used in SWEEP are able to quantify the amount of virus detected. This is described further in the Map and Percentiles and 15-Day Trends sections on the following pages.

Interpretation of SARS-CoV-2 Detection
Results can show the **presence** of infected individuals in the community and **infection trends** over time. A significant increase in the amount of virus detected over time can show that cases may be increasing in a community and should be reviewed in combination with other types of COVID-19 data.

If a virus **is detected** in wastewater:
- At least one person in the sampled community is shedding the virus. The average amount or potential range of virus shed by infected or ill individuals is not known at this time.

If a virus **is not detected** in wastewater:
- It could mean there is no virus in the sampled community **OR**
- The concentration of the virus in the sample is below the level that can be detected by the test.

⚠ Caution When Viewing Data
COVID-19 wastewater surveillance is a new field. The science continues to evolve, but there are currently limitations to consider when viewing the data for this project:

- Monitor and observe trends instead of looking at individual data points
- Cannot compare data across sample sites
- Cannot determine the total number of infected persons in a community or the percent of the population that is infected
- Shedding rate and shedding duration in feces are currently unknown for symptomatic and asymptomatic individuals
- Public health decisions should not be made solely on wastewater data and instead should be used in addition to clinical case data
- Data is reviewed for quality assurance/quality control and may be subject to change

MDHHS Michigan Department of Health and Human Services

How do we interpret this data?

Map and Percentiles

On the left side of the SWEEP Data tab, a map of Michigan shows the sentinel sites. The shape of each site is unique, because the sewershed boundary outlines the area that each wastewater treatment plant collects wastewater from.

The color of each sewershed is determined by the percentile, which describes how the concentration of virus in one sample compares to the concentration of virus detected in all other samples collected from that site. A percentile orders the samples from the lowest virus concentration detected to the highest and then describes where the sample of interest lies on that list.

Percentiles are on a scale from 0 to 100. The percentile value describes the percentage of samples that the virus level in the sample of interest is higher than. For example, a 45th percentile means the viral concentration for that sample was higher than 45% of all concentrations recorded at that site.

For easier viewing, percentiles are categorized into groups: 0-20, 21-40, 41-60, 61-80, and 81-100. Using the example above, a 45th percentile would be categorized into the 40-60th percentile group. Darker colors indicate a higher percentile, meaning higher SARS-CoV-2 concentrations are detected in the most recent sample.

The date range selection in the top right corner of the map can be used to view the percentiles over time. The percentile will be calculated using the average virus concentration for all samples collected during the selected timeframe. This average value will be treated as if it is one sample and will be ranked in the ordered list of samples accordingly.
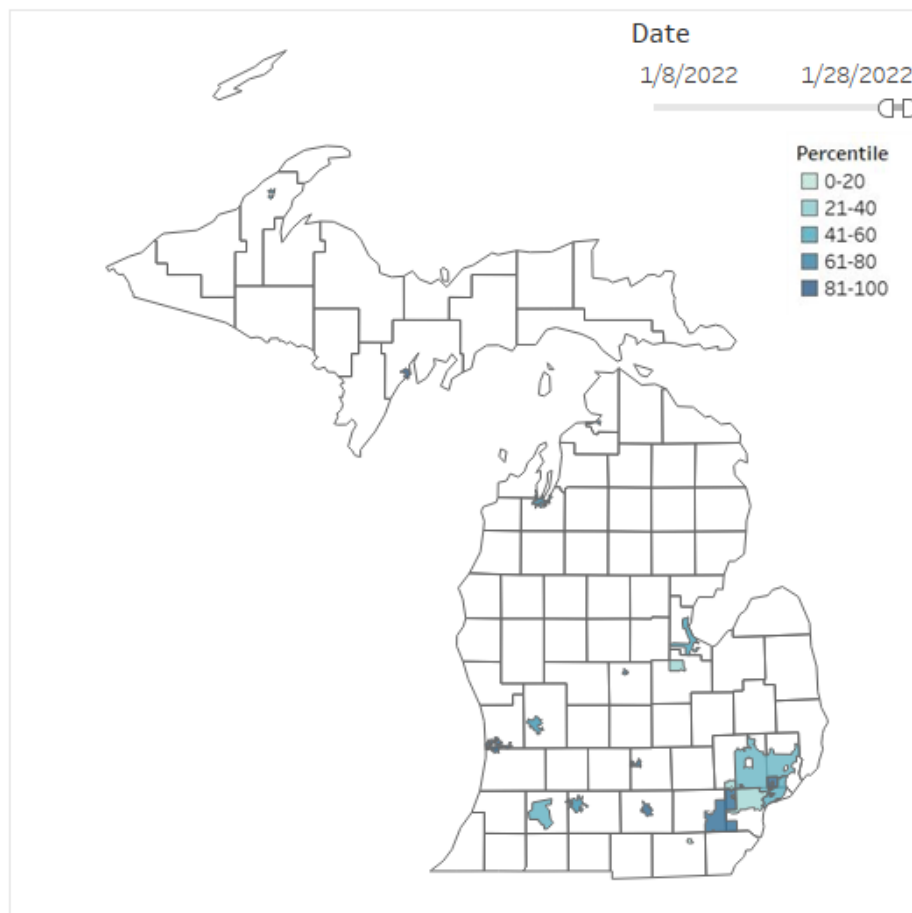
How do we interpret this data?

Map Pop-Up

By using a cursor to hover over or click on a site on the map, a pop-up window will appear with additional information about that site. At the top of the window, there is information about the most recent sample collected at that site, including the sample's percentile and a description of recent viral concentration trends. The graph shows SARS-CoV-2 concentrations in wastewater and COVID-19 cases for that community.

The virus concentrations are shown as a 3-sample average. The average requires each point to have a sample collected before and after that point. The most recent sample collected from a site will not be visible on the graph, because a sample needs to be taken afterward for an average to be calculated. Using an average helps identify trends easily. The virus concentrations represent the viral gene copies detected in 100mL of wastewater. They have been calculated per 100,000 people to adjust for varying population size across sites.

The COVID-19 cases for each sewershed are displayed as a 7-day average. Using an average makes it easier to identify trends. Cases were attributed to each sewershed based on their zip code. The cases have been calculated per 100,000 people to adjust for varying population size across sites. Case data will not be shown on the graph when the average number of cases is fewer than 10 per 100,000 people to protect the confidentiality of individuals with infections. This will be represented by an orange dashed line with gray shading below.

Bay City WWTP

The most recent sample concentration is higher than **74%** of samples collected at this site, which puts it in the **61-80 percentile** category. As of **5/2/2022**, the change in viral concentration over the past 15 days is **increasing**.

Wastewater SARS-CoV-2 Levels and COVID-19 Cases
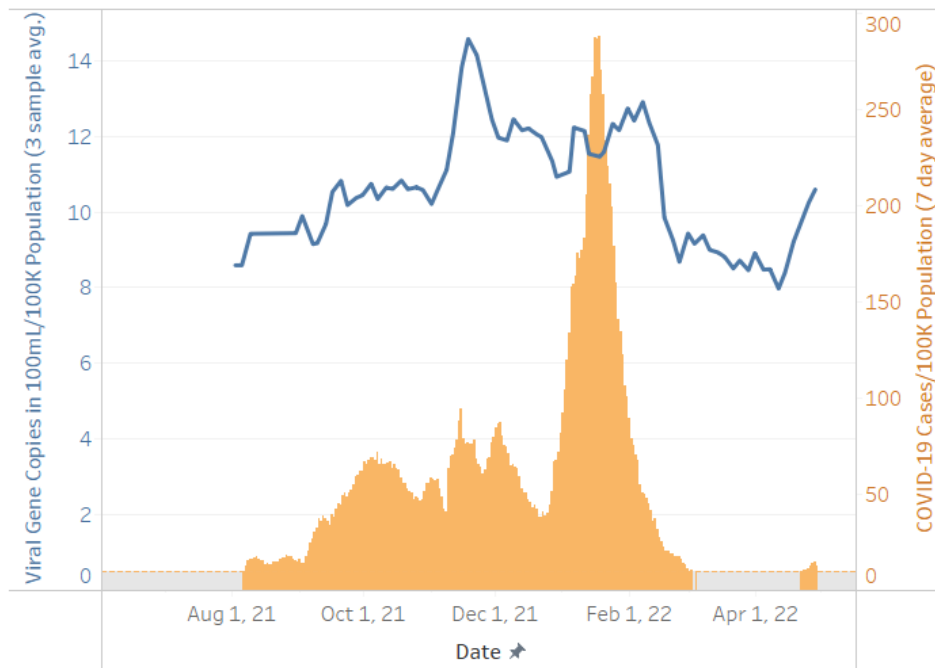
The blue line on the graph shows the levels of SARS-CoV-2, the virus that causes COVID-19, in the wastewater samples collected from Bay City WWTP. Each data point is calculated by averaging the number of viral gene copies detected per 100mL of wastewater in the 3 most recent samples. The orange bars on the graph show the COVID-19 cases reported to MDHHS from the zip codes that the wastewater treatment plant serves (7-day average). Both the virus levels and COVID-19 cases are calculated per 100,000 people. Case data will not be shown on the graph when the average number of cases is fewer than 10 per 100,000 people to protect the confidentiality of individuals with infections. This will be represented by an orange dashed line with gray shading below.

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Table of Sites

The table on the right of the SWEEP Data tab shows additional information about each of the sentinel sites. Each row corresponds to the wastewater treatment plant listed in the 'Site' column.

- 'Sewershed Population' is the estimated number of people living in the sewershed served by that treatment plant.
- 'Consecutive Weeks of Virus Detection' shows the number of weeks in a row that SARS-CoV-2 has been detected at that site. Each time the virus is not detected, the number will reset back to zero.
- 'Trend as of' is the date of the most recent sample collected at that site. This shows how current the data is for that site. This value is also important for the 15-Day Trend calculations (see section below).

Site	Sewershed Population	Consecutive Weeks of Virus Detection	Trend As Of	15-Day Trend
Alma WWTP	8976	0	4/25/2022	↓
Battle Creek WWTP	51093	2	4/27/2022	↑
Bay City WWTP	34000	3	5/2/2022	↑
Delhi Township WW..	22500	5	4/21/2022	↑
Escanaba WWTP	12600	0	4/27/2022	↓
GLWA Detroit River I..	492000	80	4/27/2022	↗
GLWA North Interce..	1482000	57	4/27/2022	↗
GLWA Oakwood-Nor..	840600	80	4/27/2022	↗
Grand Rapids WWTP	265000	38	4/28/2022	↑
Holland WWTP North	45606	2	4/27/2022	↑
Holland WWTP South	36912	4	4/27/2022	↓
Jackson WWTP	90000	41	4/29/2022	↑
Kalamazoo WWTP	150000	5	4/28/2022	↑
Petoskey WWTP	7900	2	4/28/2022	↑
Portage Lake WWTP	14000	33	4/27/2022	↑
Saginaw Township ..	40000	4	5/2/2022	↓
Tecumseh WWTP	8680	16	4/29/2022	↑
Traverse City WWTP	45000	7	4/28/2022	↑
Warren WWTP	135000	2	4/21/2022	↑
Ypsilanti WWTP	330000	41	4/28/2022	↑

15-Day Trends

The arrows in the '15-Day Trend' column of the table are percent change calculations that have been classified by their direction and magnitude.

The color reflects the magnitude of the change, with dark colors indicating more significant changes.

Viruses can multiply exponentially, which can result in a wide range of values when calculating the percent change. The trend categories were created to reflect this exponential growth. Each order of magnitude is a separate category to highlight the importance of the differences in magnitude.

The percent change is calculated for the most recent 15-day window that data is available and is specific to each site. The 15-day window includes the 'Trend as of' date and the prior 14 days.

15-Day Trends

- ↑ 1000% or more
- ↑ 100% to 999%
- ↑ 10% to 99%
- ↗ 0% to 9%
- ↘ -1% to -9%
- ↓ -10% to -99%
- ↓ -100% to -999%
- ↓ -1000% or more

Interpretation of 15-Day Trends

Dark blue, upward pointing arrows are the most concerning because they show a change of 1000% or more. This means there may be an increasing number of COVID-19 infections in the community.

In contrast, dark green, downward pointing arrows show that current COVID-19 infections may be resolving and the rate of new infections may be decreasing in the community.

Wastewater data should be reviewed with COVID-19 case data to gain a better understanding of SARS-CoV-2 transmission in the community.

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Number of Sites with SARS-CoV-2 Detected by Week Graph

The "Number of Sites with SARS-CoV-2 Detected by Week" graph on the Virus Detection tab gives a quick overview of the number of sites where the virus was detected across the state.

- Dark blue bars indicate if the virus was **detected** in samples for that week.
- Light blue bars indicate if the virus was **not detected** in samples for that week. Larger light blue portions indicate that SARS-CoV-2 levels may be lower across the state, which could mean there were fewer COVID-19 cases.
- The orange shaded region on the right side of the graph indicates the dates where some **data may be missing** due to a delay in the reporting of results to MDHHS.
- The gray portions of each bar indicate the number of sites for which **data is not available**. The gray portions are larger in Summer 2021, when the project was beginning. Each site started sampling on different dates.
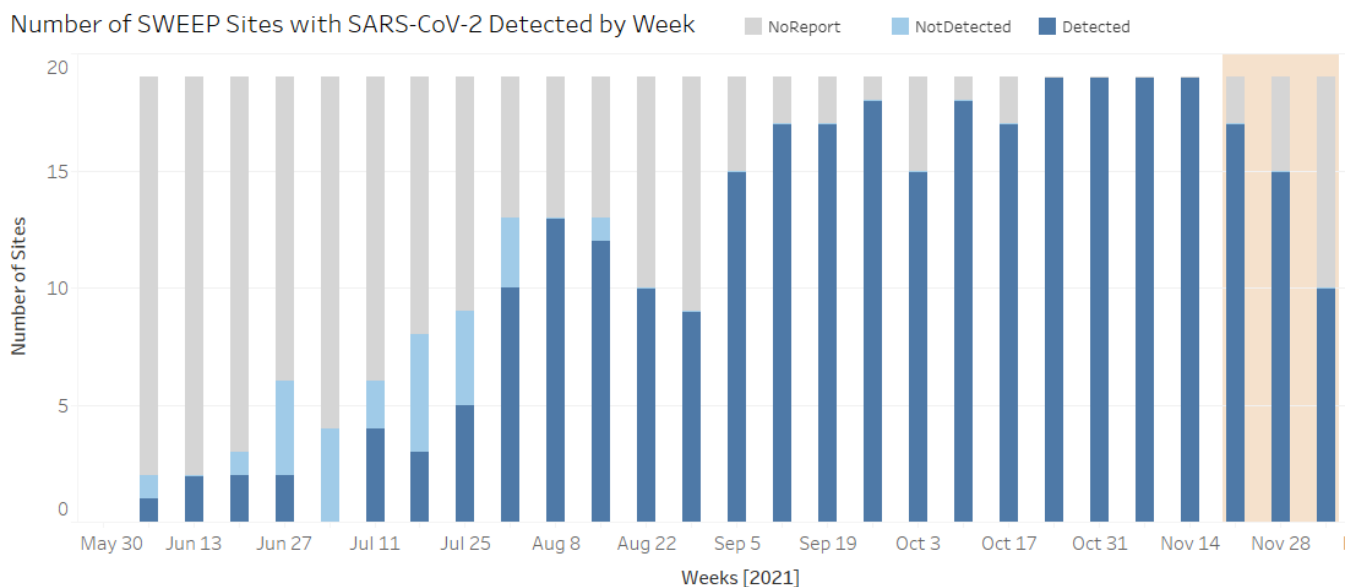
Definitions

GLWA: Great Lakes Water Authority

SARS-CoV-2: The virus that causes COVID-19

Sentinel: A site chosen to receive additional data analysis and interpretation to provide extensive information about COVID-19 trends in wastewater in a region of the state

Sewershed: The land area contributing wastewater and/or stormwater to a single downstream treatment plant.

Wastewater: The water used in a home, business, or other facility which leaves the building through pipes as waste. This contains fecal matter which may contain traces of SARS-CoV-2 from individuals who are infected with the virus.

MERC Region: The regions on the map were developed by the Michigan Economic Recovery Council (MERC). MERC regions were developed by merging Michigan's Emergency Preparedness Regions and Michigan's labor sheds – the major areas of the state where people live and travel to work based on U.S. Department of Labor data – so that any outbreak resulting from a return to work could be handled effectively under public health laws.

For More Information:

Visit the State of Michigan website on COVID-19 wastewater surveillance

Visit the EGLE website on the MI wastewater pilot project

Visit the CDC National Wastewater Surveillance System website on wastewater efforts across the country

Contact MDHHS at MDHHS-SEWERNetwork@michigan.gov